input and output may be stored. In other words, measured results of the sensor 110 and the bio-signal obtained by the signal processor 120 may be stored. The memory 140 may store the bio-signal input in real time in a buffer memory. The CPU 130 may execute the blood pressure estimation algorithm that is stored in the memory 140 to estimate blood pressure.

[0046] The memory 140 may include at least one type of storage medium such as, for example, a flash memory type memory, a hard disk type memory, a multimedia card micro type memory, a card type memory (e.g., a secure digital (SD) memory and an extreme digital (XD) memory), a random access memory (RAM), a static random access memory (SRAM), a read-only memory (ROM), an electrically erasable programmable read-only memory (EEPROM), a programmable read-only memory (PROM), a magnetic memory, a magnetic disk, a photo disk, etc.

[0047] The CPU 130 may control an operation of the sensor 110 and measure blood pressure by using the blood pressure estimation algorithm. In other words, the CPU 130 may calculate blood pressure by using the blood pressure estimation algorithm from the bio-signal obtained through processing the signal measured by the sensor 110 in the signal processor 120. The CPU 130 may also control the memory 140, the display 160, the signal processor 120, and the biometric information input unit 150.

[0048] The CPU 130 may extract various features from the bio-signal, for example, a waveform of the PPG signal. In addition, the CPU 130 may estimate a blood pressure value by combining the extracted features and a matrix of the blood pressure estimation algorithm. In this case, the blood pressure value estimated by the CPU 130 may include a systolic blood pressure and a diastolic blood pressure.

[0049] The blood pressure value calculated in the CPU 130 may be displayed on the display 160. The display 160 may display the systolic blood pressure and the diastolic blood pressure.

[0050] The biometric information input unit 150 may receive physical characteristic information of the subject such as sex, age, height, and weight. The biometric information input unit 150 may also receive blood pressure information of the subject to increase an accuracy of blood pressure calculation. The blood pressure information may be already known information such as the systolic blood pressure and the diastolic blood pressure. The CPU 130 may determine the subject as belonging to one of predetermined groups in accordance with hemodynamic characteristics of the subject based on information input via the biometric information input unit 150, and may estimate blood pressure by applying a blood pressure estimation algorithm corresponding to the determined group. The groups in accordance with hemodynamic characteristics may be classified beforehand according to heartbeat, the systolic blood pressure, the diastolic blood pressure, cardiac output, a change in total peripheral resistance and pulse transit time.

[0051] The data transmission unit 170 may transmit a result analyzed in the CPU 130 to other external devices. The blood pressure value calculated and estimated in the CPU 130 may be output on the display 160, and the data transmission unit 170 may transmit the blood pressure value and the heart rate value to an external device such as a smart phone or a computer by using, for example, a communication device such as Bluetooth.

[0052] The external device may be the smart phone and the computer. Also, the external device may be medical equipment using analyzed blood pressure information, a printer to print out a result or a display device displaying an analyzed result. In addition, the external device may include various devices such as a tablet personal computer (PC), a personal digital assistant (PDA), a laptop, and other mobile or non-mobile computing devices.

[0053] The data transmission unit 170 may be connected to the external device via wire or wireless communication. For example, the data transmission unit 170 may communicate with the external device using various communication methods such as Bluetooth communication, Bluetooth low energy (BLE) communication, near field communication (NFC), wireless local area network (WLAN) communication, Zigbee communication, infrared data association (IrDA) communication, Wi-Fi direct (WFD) communication, ultra wideband (UWB) communication, Ant+communication and Wi-Fi communication.

[0054] The apparatus for estimating blood pressure 100 may further include a user interface (UI). The UI is an interface between a user and/or the external device, and may include an input unit and an output unit. Here, the user may be an object whose blood pressure is measured, that is, the subject; however, the user may be a person utilizing the apparatus for estimating blood pressure 100, such as a medical professional. Requisite information may be input to operate the apparatus for estimating blood pressure 100 through the UI and an analyzed result may be output. The UI may include, for example, a button, a connector, a keypad, a touch screen, etc., and may further include components such as a sound output unit and a vibration motor.

[0055] The apparatus for estimating blood pressure 100 may be a type of wearable device, a type of mobile phone such as a mobile smart phone type, or a type of tablet device. In other words, the apparatus for estimating blood pressure 100 may be mounted on the wearable device, the mobile phone such as the mobile smart phone, or the tablet device. In addition, the apparatus for estimating blood pressure 100 may be realized in such a form that it may be placed around a finger to measure blood pressure, that is, a finger tongs type apparatus.

[0056] For example, the apparatus for estimating blood pressure 100 may be realized as a device being worn by the subject, that is, in a shape of a wearable device. The wearable device may be realized as a wrist watch type, a bracelet type, or a wrist band type, and in addition, may be realized as various types such as a ring type, a glasses type, an earphone type, a headset type, or a hair-band type. In addition, only some components of the apparatus for estimating blood pressure 100, for example, the sensor 110 and the signal processor 120, may be worn by the subject.

[0057] The apparatus for estimating blood pressure 100 may be used as a device for estimating blood pressure and measuring the heart rate of the subject by being applied, for example, as a substitute for a sensor measuring a heart rate only, to a wrist watch-type wearable device which measures the heart rate by using a back side of a main body of the wrist watch. In addition, the apparatus for estimating blood pressure 100 may be applied to a smart phone, etc., utilizing the light emitting device and the CIS in order to estimate the blood pressure and to measure the heart rate of the subject.